

Audiology (0341)

Test at a Glance

Test Name	Audiology		
Test Code	0341		
Time	2 hours		
Number of Questions	120		
Format	Multiple-choice questions		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	<ul style="list-style-type: none"> I. Foundations II. Prevention and Identification III. Assessment IV. Intervention V. Professional Issues 	<ul style="list-style-type: none"> 12 12 48 36 12 	<ul style="list-style-type: none"> 10% 10% 40% 30% 10%

About This Test

The Audiology test measures knowledge important for independent practice as an audiologist in all primary employment settings including schools, hospitals, clinics, private practice, etc. The examination is typically taken by examinees who are in or who have completed a doctoral degree program that prepares individuals to enter professional practice. Recognized as the national examination in audiology, the test is one of several requirements for the Certificate of Clinical Competence issued by the American Speech-Language-Hearing Association (ASHA). Some states use the examination as part of the licensure procedure. Examinees may obtain complete information about certification or licensure from the authority or state or local agency from which certification or licensure is sought. (ASHA is at www.asha.org and 2200 Research Boulevard, Rockville, MD 20850.)

The 120 multiple-choice test questions focus on content related to the major practice areas of prevention, identification, assessment and intervention, together with foundational knowledge and knowledge of standards of professional practice. Application of knowledge will be tested in the context of clinical case studies research results, and results of assessments (physiologic, behavioral and other types of assessment).

The content of the test is based on a practice and curriculum analysis commissioned by ASHA: a national survey of audiologists in both clinical and educational settings.

This test may contain some questions that will not count toward your score.

Topics Covered

Representative descriptions of topics covered in each category are provided below.

I. Foundations (10%)

- Acoustics/psychoacoustics
 - basic parameters of sound
 - principles of acoustics as related to speech sounds
 - sound measurement
 - psychoacoustic principles, methods, and applications
- Anatomy, physiology and behavior over the life span
 - the auditory system
 - the balance system
 - neuroanatomy and neurophysiology
 - embryology and development of hearing and balance mechanisms
 - normal processes of auditory behavior over the life span
 - language and speech characteristics and their development over the life span
 - effects of hearing loss on language and speech, and on educational, vocational, social and psychological functioning
- Etiology
 - genetics and associated syndromes related to hearing and balance
 - pathologies related to hearing and balance and their medical diagnosis and treatment
- Pharmacology, ototoxicity and vestibulotoxicity
- Psychometrics and Instrumentation
 - test construction principles
 - test reliability, and validity
 - calibration of audiometric equipment
- Principles of counseling
- Cultural and linguistic diversity, including Deaf Culture

II. Prevention and Identification (10%)

Education and Prevention (Conservation)

- Informing clients about
 - causes and effects of hearing loss (congenital and acquired)
 - causes and effects of vestibular disorders
 - protection from hearing loss and vestibular disorders

- Universal precautions, including infection control and bioelectrical hazards
- Selecting and fitting hearing protection devices (HPDs)

Screening and Risk Assessment

- Selecting and administering procedures to identify individuals who require
 - further audiologic evaluation and/or treatment
 - referral for speech and/or language assessment
 - referral for other professional services
- Identifying individuals at risk for balance problems and falls who require further vestibular evaluation and/or treatment
- Newborn hearing screening programs (early hearing detection and intervention [EHDI])
- Selecting, administering, and interpreting self-report measures of hearing problems

III. Assessment (40%)

Assessment Planning

- Gathering and evaluating client information (case histories and information from referral sources) to facilitate assessment planning and identify potential etiologic factors
- Verifying proper functioning of assessment equipment
- Selecting and modifying procedures based on client factors, e.g., age, developmental level, functional status, behavior, cultural and linguistic diversity, physical, sensory, and cognitive abilities

Audiologic Evaluation – Behavioral

Administering and interpreting

- Pure-tone air and bone conduction testing
- Speech audiometry
- Tests for functional hearing loss
- Tests for children above 6 months developmental age, e.g., visual reinforcement audiometry and conditioned-play audiometry

Audiologic Evaluation – Physiologic

Administering and interpreting

- Immittance testing
 - tympanometry
 - acoustic reflex thresholds
 - reflex decay
- Otoacoustic emission (OAE) testing
- Auditory evoked potentials
 - Auditory brainstem response (ABR) testing
 - threshold testing with clicks
 - threshold testing with tone bursts
 - ABR bone conduction threshold testing
 - ABR for neurodiagnostic evaluation
 - Auditory steady state response (ASSR)

Other Assessments and Evaluations

Administering and interpreting

- Otoscopy: performing otoscopy and ensuring appropriate follow-up, including diagnostic evaluations, intervention, and referrals
- Self-report measures of hearing problems and their impact on daily living
- Balance system assessment, e.g.,
 - videonystagmography (VNG)
 - electronystagmography (ENG)
 - rotational tests
- Assessment of communication function, e.g.,
 - speech in noise testing
 - spatial testing
 - self-report measures
- Assessment of tinnitus, e.g.,
 - pitch matching
 - loudness matching
 - self-report measures
- Evaluating (central) auditory processes, e.g.,
 - gap detection
 - dichotic digits
 - filtered speech

Integrating Assessment Results

- Integrating assessments (behavioral, physiologic, neurodiagnostic, and other evaluations)
 - to establish type and severity of hearing loss
 - to support recommendations for further evaluation and/or referral
- Integrating balance function tests (e.g., VNG) with other results to evaluate balance function

Documentation and Communication

- Documenting the procedures and results of evaluations
- Generating recommendations based on evaluations, including referrals, as appropriate, to other audiologists and related professionals
- Communicating results and recommendations to relevant individuals (e.g., clients, caregivers, physicians, agencies) to coordinate a plan of action
- Interacting effectively with clients, families, other appropriate individuals, and professionals including working with interpreters (ASL and other languages, sign systems) to effectively communicate with clients

IV. Intervention (30%)

Treatment Planning

- Evaluating client information to facilitate treatment planning:
 - information from referral sources
 - case histories
- Selecting and modifying treatment procedures based on client factors, e.g., age, developmental level, functional status, behavior, cultural and linguistic diversity, physical, sensory, and cognitive abilities
- Integrating results of assessments and other evaluations to support recommendations for treatment and/or referral

Device Selection

- Evaluating client's perceived hearing handicap and expectations related to hearing devices
- Determining candidacy for and selecting:
 - hearing aids
 - other assistive listening and alerting devices
 - cochlear implant(s)
 - other implantable devices (e.g., bone-anchored hearing aids)
- Determining candidacy for and selecting:
 - hearing assistive technology system (HATS) for adults, e.g., personal and group amplification systems, assistive listening and alerting devices
 - hearing assistive technology system (HATS) for children

Hearing Aids

- Evaluating, for the purpose of hearing aid selection,
 - speech recognition in noise
 - loudness discomfort
- Programming hearing aids
- Hearing aid coupling, e.g., ear mold modifications, sound bore length, materials
- Selecting features and processing strategies based on client communication needs, e.g.,
 - type of amplitude processing
 - feedback suppression
 - direct audio input

Cochlear Implants

- Programming cochlear implants
- Evaluating implant effectiveness and making appropriate modifications
- Selecting processing and programming strategies based on client communication needs

Device Verification and Validation

- Verifying proper functioning of hearing aids and other assistive devices
- Conducting quality control measures (e.g., electroacoustic measures, feature-specific probe microphone measures) on hearing technology
- Probe microphone verification for children, e.g.,
 - real ear to coupler difference (RECD)
 - aided thresholds
- Probe microphone verification for adults, e.g.,
 - real ear insertion gain (REIG)
 - real ear aided response (REAR)
 - real ear saturation response (RESR)
- Evaluating hearing technology effectiveness, e.g., outcome measures, aided speech recognition
- Repairing and modifying hearing technology devices, when appropriate

Audiologic (Re)habilitation/Intervention

- Evaluating and modifying audiologic (re)habilitation, including therapy schedule, discharge criteria, frequency, duration, and type of service
- Teaching communication strategies to clients and their significant others, e.g.,
 - speech reading
 - conversational repair strategies

- Facilitating communication development and/or auditory learning (listening, speech, expressive and receptive language)
- Providing support for school-age children, e.g.,
 - counseling
 - addressing the acoustic environment
 - consulting with educational personnel
 - providing direct therapy

Tinnitus Management

- Counseling, and sound management intervention (e.g., environmental sound sources, ear level sound generators) and follow-up

Vestibular Rehabilitation

- Treatment for benign paroxysmal positional vertigo (BPPV)

Counseling

- Counseling related to device use and safety
- Counseling children’s caregivers about hearing loss, communication development and modes of communication
- Providing individual, family, and group counseling related to hearing loss and subsequent communication and areas of psychosocial, behavioral, vocational, and educational adjustment
- Making referrals, as appropriate, to other audiologists and related professionals

Documentation and Communication

- Documentation of intervention processes and results
- Generating recommendations resulting from intervention processes
- Communication of recommendations to relevant individuals (e.g., clients, caregivers, physicians, agencies) to coordinate a plan of action
- Interacting effectively with clients, families, other appropriate individuals, and professionals including working with interpreters (ASL and other languages, sign systems) to effectively communicate with clients about treatment

V. Professional Issues (10%)

Professional Practice

- Different service delivery models in health care and school-based settings
- Management and business practices, e.g.,
 - coding and reimbursement
 - case management
- Effective and appropriate communication of results, recommendations, and intervention status
 - selecting the means of communication, e.g., formal reports, notes, e-mails, phone calls
 - using language appropriate for the recipient
 - maintaining client/patient privacy
- Equipment calibration and maintenance to standards and manufacturer's specifications

Legal and Ethical Practice and Advocacy

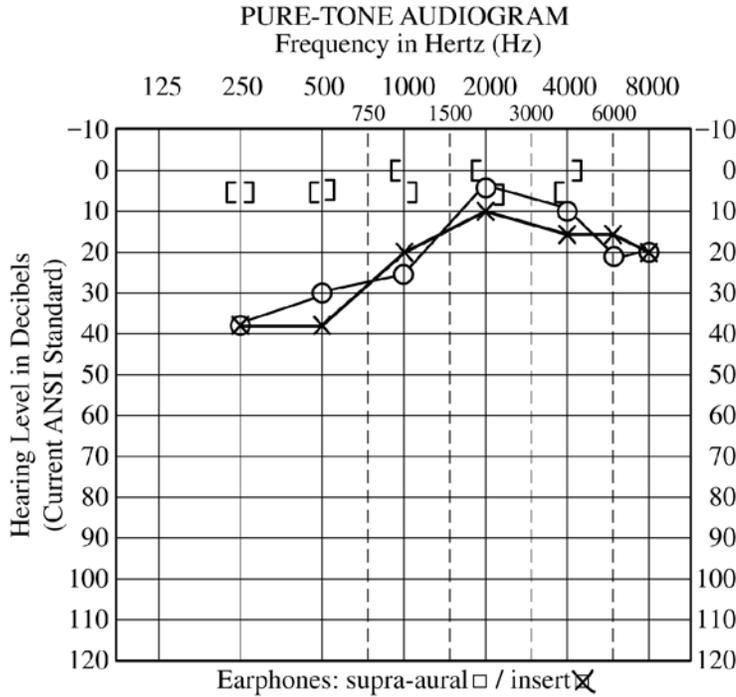
- Standards for professional conduct
- Protection of clients'/patients' rights
- Legislative, and regulatory mandates
- Advocacy for appropriate services
 - underserved populations
 - inclusion of services in individualized education programs (IEPs)
 - insurance appeals

Evidence-Based Practice

- Application of research findings to maintain currency in care
- Research principles and practices, e.g., experimental design, statistical methods, and application to clinical populations

Sample Test Questions

The sample questions that follow illustrate the kinds of questions in the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.



KEY:

Right	Stimulus	Left
○	Air	×
<	Bone	>
△	Masked Air	□
⌈	Masked Bone	⌋
∨	No Response	∨
Sound Field: S		

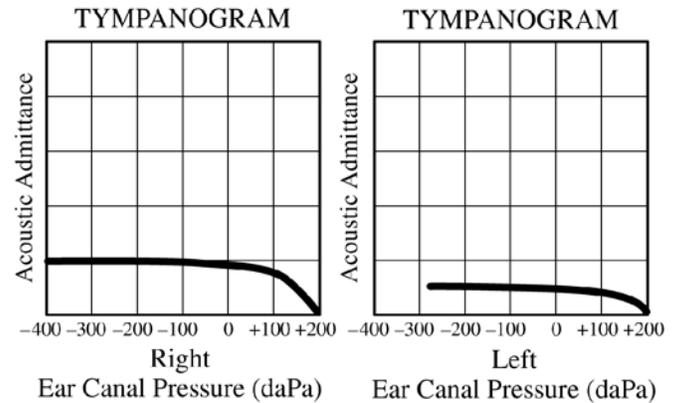
SPEECH AUDIOMETRY

	PTA (dB HL)	SRT SAT (dB HL)	Word / Sentence Recognition	Word / Sentence Recognition	MCL (dB HL)	UCL (dB HL)
Right	20	15	%	dB HL	%	dB HL
Left	22	15	%	dB HL	%	dB HL
MLV Recorded		TEST MATERIAL:				

TYMPANOMETRY

226 678 / 1000 Hz (circle one)

	Right	Left
Peak-Compensated Static Admittance (mmho)	∅	∅
Tympanometric Peak Pressure (daPa)	no peak	no peak
Tympanometric Width (daPa)	0.48	0.4
Equivalent Ear Canal Volume (cm ³)	N/A	N/A



ACOUSTIC REFLEX

	Stimulus Right	500	1K	2K
CONTRA Threshold (dB HL)	Absent	→	→	→
CONTRA Decay (pos/neg)				
IPSI Threshold (dB HL)	Absent	→	→	→
IPSI Decay (pos/neg)				

ACOUSTIC REFLEX

	Stimulus Left	500	1K	2K
CONTRA Threshold (dB HL)	Absent	→	→	→
CONTRA Decay (pos/neg)				
IPSI Threshold (dB HL)	Absent	→	→	→
IPSI Decay (pos/neg)				

Directions: Each of the questions or incomplete statements that follow are followed by five suggested answers or completions. Select the one that is best in each case.

Questions 1–4 are based on the following case.

Kim is a 6-year-old girl whose parents brought her to the audiology clinic because she has been having academic trouble in school. According to her classroom teacher, Kim has difficulty following directions. She appears to stare blankly when the teacher is speaking to the class and never answers questions. Kim reportedly has had three sinus infections in the past eight months that have been treated by her pediatrician. She is scheduled to see an allergist next month.

Audiometric data for Kim is shown on the data sheet on page 6.

1. Based on the audiometric and case history information provided here, which of the following is the most likely etiology for Kim's hearing loss?
 - (A) otosclerosis
 - (B) chronic otitis media
 - (C) bilateral atresia
 - (D) impacted cerumen
 - (E) perforated tympanic membrane
2. Which of the following scores are mostly likely to be obtained if word recognition is assessed using an age appropriate test at 40 dB SL?
 - (A) 70% right ear, 66% left ear
 - (B) 60% right ear, 80% left ear
 - (C) 80% right ear, 72% left ear
 - (D) 88% right ear, 90% left ear
 - (E) 100% right ear, 70% left ear
3. To accommodate Kim's needs, the audiologist would most appropriately recommend which of the following?
 - (A) Binaural bone-anchored hearing aids
 - (B) A mild gain hearing aid for use in the classroom
 - (C) Individual tutoring outside the classroom for 3 hours/day
 - (D) Referral to an otolaryngologist for a cochlear implant evaluation
 - (E) Preferential classroom seating and regular monitoring of middle ear status
4. According to IDEA, the audiologist's recommendations for this child should be addressed in which of the following documents?
 - (A) Individualized Family Service Plan
 - (B) Individualized Education Program
 - (C) Report Card
 - (D) Behavioral Intervention Plan
 - (E) Cumulative academic record

5. A six-month-old child born with bilateral bony atresia is seen for an audiological evaluation and treatment recommendation. Radiological evidence indicates the probable presence of an intact middle ear and cochlea. ABR responses have been obtained at near-normal levels to bone-conducted signals. Of the following, the most appropriate course of action for this child at this time would be to
- defer treatment until growth of the external and middle ear is complete at about age 6
 - suggest that surgery be initiated on at least one ear to permit a normal air-conducted pathway
 - recommend an implanted bone-anchored hearing aid
 - investigate the use of a bone-conduction hearing aid until audiological test results can be confirmed and surgery initiated when the child is older
 - counsel the parents concerning sign language and initiate a treatment program based on the use of all visual cues
6. Which of the following statements about a caloric response yielding a left unilateral weakness in the interpretation of videonystagmography results is most accurate?
- It suggests a right peripheral vestibular disorder of the labyrinth.
 - It is of no real value in the interpretation.
 - It suggests a nonspecific (nonlocalizing) vestibular disorder.
 - It suggests a left peripheral vestibular disorder of either the labyrinthine or the VIIIth nerve.
 - It suggests a central vestibular disorder.
7. The accuracy of a hearing screening test in correctly identifying those individuals who actually have a hearing disorder is referred to as the screening test's
- reliability
 - validity
 - precision
 - specificity
 - sensitivity
8. Carol is a 34-year-old woman with a sudden-onset, left-sided facial paralysis that has been diagnosed as Bell's palsy. Acoustic reflexes are present at normal levels bilaterally for both ipsilateral and contralateral stimulation. Which of the following statements accurately applies to this situation?
- The pathology is proximal to the stapedial branch of the VIIth nerve.
 - The pathology is distal to the stapedial branch of the VIIth nerve.
 - The patient has a left acoustic neuroma.
 - The facial paralysis is probably nonorganic in nature.
 - No reliable statement can be made about VIIth nerve function, since the responses could be due to Vth nerve activity.
9. Of the following, the most likely adult candidate for a cochlear implant is one with a
- bilateral hearing loss due to chronic otitis media
 - bilateral hearing loss due to noise exposure
 - bilateral hearing loss due to adult meningitis
 - unilateral hearing loss of sudden onset and unknown etiology
 - unilateral hearing loss secondary to surgery for vestibular schwannoma
10. According to PL 99-457, a child under 2 years of age who has a hearing impairment must
- be fitted with binaural hearing aids
 - have biannual hearing evaluations
 - be enrolled in a center-based habilitation program
 - have a written individualized family service plan
 - be provided with total communication training
11. Which of the following is typically the best choice of amplification for a person with bilateral moderate conductive hearing loss and chronic drainage from both ears?
- Behind-the-ear aids with vented earmolds
 - A body-worn hearing aid
 - A vibrotactile aid
 - A bone-conduction hearing aid
 - A multichannel cochlear implant

12. In the measurement of real-ear sound-pressure levels with a probe-tube microphone system, insufficient probe-tube depth will tend to
- (A) increase the high-frequency response
 - (B) decrease the high-frequency response
 - (C) decrease the response at all frequencies
 - (D) decrease the low-frequency response
 - (E) increase the low-frequency response
13. The measurement of distortion product otoacoustic emission (DPOAE) involves the presentation of pairs of pure tones to the patient's ear. Which auditory response does this test measure?"
- (A) Cubic difference tone
 - (B) Summation tone
 - (C) First and second harmonics
 - (D) Resonance in outer hair cells
 - (E) Resonance in inner hair cells
14. A client with a history of bilateral profound sensorineural hearing loss, lack of vestibular function, and progressive retinal deterioration is scheduled for an audiological assessment.
- Which etiology is consistent with the client's history?
- (A) Auditory neuropathy
 - (B) Vestibular schwannomas
 - (C) Neurofibromatosis
 - (D) Usher's syndrome
 - (E) Meningitis
15. The area of the ear canal where most cerumen is generated is
- (A) at the isthmus
 - (B) at the eardrum
 - (C) the bony portion
 - (D) the middle third of the canal
 - (E) the outer third of the canal
16. A child comes to the clinic due to problems understanding the teacher at school. The child has a moderate hearing loss and wears bilateral hearing aids. Aided speech-recognition scores at 55 dB HL in quiet were 88 percent correct, with scores being 60 percent correct with a +5 SNR. Which of the following would be the best recommendation for the child?
- (A) Increase the gain of the hearing aid
 - (B) Utilize directional microphones with the hearing aids
 - (C) Utilize a personal frequency modulation (FM) system with the hearing aids
 - (D) Utilize a low-gain frequency modulation (FM) system with headphones
 - (E) Refer for a cochlear implant evaluation
17. Known types of presbycusis can be attributed to each of the following EXCEPT
- (A) degeneration of sensory hair cells
 - (B) degeneration of auditory neurons
 - (C) degeneration of the stria vascularis
 - (D) degeneration of the ossicular joint
 - (E) structural changes in the basilar membrane

18. Which of the following best identifies the appropriate tools to screen for newborn hearing loss in accordance with the Joint Committee on Infant Hearing guidelines?

In the
well-baby
nursery

- (A) ABR
- (B) OAE
- (C) OAE and ABR
- (D) OAE, ABR, and ASSR
- (E) ABR

In the
neonatal
intensive care unit

- OAE
- OAE and ABR
- ABR
- OAE and ABR
- ABR and ASSR

19. In 2002, the American National Standards Institute (ANSI) adopted guidelines for classroom acoustics, intended for use in the design of new classrooms and in the renovation of existing classrooms. The ANSI-recommended average noise levels and reverberation times for unoccupied classrooms (< 10,000 cubic feet) are

- (A) 15 dBA or less and 0.2 seconds or less
- (B) 25 dBA or less and 2.0 seconds or less
- (C) 35 dBA or less and 0.6 seconds or less
- (D) 45 dBA or less and 2.0 seconds or less
- (E) 55 dBA or less and 0.2 seconds or less

Answers

1. The correct answer is (B). According to the case history provided, the patient is a 6-year-old child who has experienced recurrent sinus infections and likely has allergies. Together with the audiometric data that reveal a bilateral hearing loss with air-bone gaps, flat tympanograms and absent acoustic reflexes suggest a conductive hearing loss. The flat tympanograms rule out the possibility of otosclerosis. The degree of hearing loss and the fact that tympanograms were obtained indicate that atresia is not present. The degree of hearing loss cannot be accounted for by impacted cerumen. The equivalent ear canal volume is too small to be associated with eardrum perforation. Thus, the only answer that fits with all of the audiometric results and the history is chronic otitis media (B).

2. The correct answer is (D). The pure-tone air and bone conduction thresholds together with the immittance results indicate that this 6-year-old child has a purely conductive, bilateral hearing loss. Thus, it is expected that once speech is clearly audible to the child, word recognition ability will be good to excellent bilaterally. The only reasonable choice of word recognition scores is therefore 88% right ear, 90% left ear (D). All of the other choices include scores that are much too poor either unilaterally or bilaterally.

3. The correct answer is (E). Because the history and audiometric results indicate bilateral otitis media, which can be treated medically, a bone-anchored hearing aid is not a reasonable choice for remediation. Likewise, a mild-gain hearing aid for classroom use is not warranted unless it is determined that medical treatment does not improve auditory acuity. While tutoring may be beneficial if the child is having a problem with a specific subject, Kim should remain in the classroom for as much of the school day as possible. Thus, taking her out of class for three hours a day is not feasible. Providing her with preferential seating and monitoring her middle-ear status is clearly the most appropriate remediation strategy for the educational audiologist to recommend for Kim.

4. The correct answer is (B). All children with documented hearing loss must be followed by the school, and the specific recommendations for each child must be described in an Individualized Education Program. An Individualized Family Service Plan, (A), is required for children 0 to 3 years of age. Under IDEA, report cards are not required to indicate an audiologist's recommendations. The case study does not indicate that Kim has behavioral problems, so a behavioral intervention plan is not correct. A child's cumulative record does not reflect any related service recommendation.

5. The correct answer is (D). The evaluation shows that the middle ear and the cochlea are probably intact and that a surgeon has only to open the occluded canals for hearing to be made functional. However, to perform surgery on a six-month-old child without having more information about hearing competence would be unwarranted. Because bilateral atresia often can be handled through a bone-conduction hearing aid, such a device should be tried first and the child's growth and development monitored to determine when surgery should take place.

6. The correct answer is (D). A unilateral weakness indicates a disorder of the labyrinth or the VIIIth nerve on the same side as the weakness. Thus, in this case the disorder is indicated on the left, not the right, side: (D) is the correct answer and (A) is incorrect. The finding is of great value, since it has determined that a unilateral peripheral problem exists, so (B) is incorrect. (C) is incorrect because the disorder is localized to the periphery. (E) is incorrect because a central disorder is ruled out by these results.

7. The correct answer is (E). The question gives a definition of test sensitivity. (A) is incorrect because not all sensitive tests have reliability (the ability of the test to show consistent results for the same subject under different conditions). Validity is the ability of a test to measure what it is designed to measure; a test can be sensitive without being valid if there are too many false-positives, so (B) is incorrect. (C) is incorrect because a test can correctly identify individuals with hearing disorders without identifying the subjects' precise thresholds. Specificity refers to how accurately the test identifies those individuals who do not have a hearing loss, so (D) is incorrect.

8. The correct answer is (B). The acoustic reflex measurement helps to determine the site of lesion of facial nerve disorder as either distal or proximal to the stapedial branch of the VIIth nerve. If the acoustic reflex is present at normal HTLs, the localization of pathology is likely distal to the stapedius branch of the nerve.

9. The correct answer is (C). Cochlear implants are typically recommended for individuals with profound or severe-to-profound bilateral sensorineural hearing losses; adult meningitis is likely to cause such hearing loss. (A) and (B) are incorrect because individuals with hearing losses due to noise exposure or chronic otitis media are likely to benefit from amplification; hearing losses with those etiologies tend to be less than profound. Unilateral hearing losses generally do not require intervention as drastic as a cochlear implant, so (D) and (E) are incorrect. Furthermore, (E) is incorrect because successful use of a cochlear implant requires an intact auditory nerve (VIIIth nerve) and surgery for vestibular schwannoma usually destroys this nerve.

10. The correct answer is (D). P.L. 99-457 specifies that a plan be developed, but does not specify the type of services to be delivered. All other answer choices specify particular types of services.

11. The correct answer is (D). A bone-conduction hearing aid can boost the bone-conduction signal and provide enough amplification to be helpful to clients with moderate hearing loss, and the hearing aid will not interfere with the drainage of the ear. Hearing aids with earmolds are unsuitable for clients with chronic drainage because the drainage would damage the earmold, and the additional blockage of the external canal would exacerbate the drainage problem and increase the likelihood of infection; thus (A) is incorrect. Body-worn hearing aids are coupled to earmolds and may provide more power than is necessary for people with only moderate hearing loss, so (B) is incorrect. Vibrotactile aids and cochlear implants are useful only for clients with profound hearing losses who cannot benefit from amplification, so (C) and (E) are incorrect.

12. The correct answer is (B). Probe tubes for measuring real-ear sound-pressure levels (SPL) should be inserted as close to the tympanic membrane as possible, since it is the SPL at the tympanic membrane that is being measured. If the probe tube is too far from the tympanic membrane, high-frequency sound waves bounced off the eardrum will dissipate before reaching the probe, but low-frequency sound waves, which do not dissipate as easily, will be essentially unaffected. The overall effect will thus be a decrease only in the high-frequency response.

13. The correct answer is (A). As noted in the question, a pair of tones is presented via an earphone in the measurement of DPOAEs. Because the normal auditory system is nonlinear, when two primary tones are introduced into the ear, distortion products are produced. The largest distortion product, and the one recorded in the evaluation of DPOAEs, is the cubic difference tone. A summation tone may occur and harmonics may occur, but they will be very small, definitely not large enough to be measured. Hair cells do not resonate, so the other answers are not possible.

14. The correct answer is (D). Approximately 40 percent of patients with Usher's syndrome show a profound hearing loss with vestibular dysfunction and an early onset of retinitis pigmentosa (RP), a progressive degeneration of the retina that leads to loss of night vision, restriction of visual fields, and, ultimately, blindness. (A), (B), (C), and (E) are incorrect because the etiologies are not associated with progressive visual deterioration.

15. The correct answer is (E). Cerumen is created by a combination of secretions of sweat glands and sebum glands, which are located in the cartilaginous outer third of the ear canal.

16. The correct answer is (C). Using an FM system provides the most benefit in improving signal-to-noise ratio, so (C) would be the most appropriate recommendation for a child who has difficulty understanding speech in noise. As such, (A) and (B) would not be the most appropriate answer. A low-gain FM system would not be appropriate considering the moderate hearing loss and the use of hearing aids. Since the child does not have a severe to profound hearing loss, (E) would not be an appropriate answer because cochlear implants are for patients with severe to profound hearing loss.

17. The correct answer is (D). The ossicular joint is not involved in presbycusis. (A), (B), (C), and (E) are the causes of four identified types of presbycusis: (A) causes sensory presbycusis, (B) causes neural presbycusis, (C) causes strial presbycusis, and (E) causes cochlear conductive presbycusis.

18. The correct answer is (C). The guidelines clearly indicate that ABR is the screening tool to be used in the neo-natal intensive care unit (NICU). For an infant in the well-baby nursery, OAE can be used for screening, but ABR could also be used. (D) and (E) are incorrect because ASSR is not a recommended screening tool. (A) and (B) are incorrect because OAE is not recommended for use in the NICU.

19. The correct answer is (C) because it captures the recommendations for any core learning space with an enclosed volume below 10,000 cubic feet. By the ANSI guidelines, the classroom acoustics indicated by (D) and (E) would exceed the recommended noise levels for an unoccupied classroom, while the noise levels indicated by (A) and (B) are stricter than the recommendations, which were designed for practical application in school settings. The acoustics indicated by (B) and (D) would allow reverberation times that exceed the recommendations for classrooms.



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